REMARKS

Applicant has the following comments in response to the above-office action.

Discussion of Claim Status

In the Office Action mailed February 19, 2004, the Examiner rejected Claims 1-4, 13, 14, and 24-48. Claims 5-12 and 15-23 are allowed.

Summary of Examiner Interview

Applicant expresses appreciation to the Examiner for the interview conducted with Applicant's representative, Steven Stewart, with respect to the above-identified patent application. In the interview, references applied by the Examiner were discussed, and it was agreed that Applicant would file an RCE and amend the claims to more clearly distinguish over the cited art. In response to this interview, Applicant has submitted herewith amendments to the claims which more clearly distinguish over the cited art.

Discussion of Claim Rejections Under 35 U.S.C. § 103(a)

In the Office Action, the Examiner rejected Claims 1-4, and 13, 14, and 24-48 as being unpatentable in view of U.S. Patent No. 6,269,484, to Simsic, et al. (hereinafter "Simsic") in view of U.S. Patent No. 6,178,205, to Cheung, et al. (hereinafter "Cheung"). Applicant respectfully disagrees with these rejections.

One embodiment of the invention is directed to a filter for filtering compression artifacts from a decoded video sequence. These artifacts can result from the coarse quantization of a prediction error signal. In one embodiment, the strength of a filter that is applied to the compression defects is set as a function of the motion activity within the video sequence. Applicant respectfully submits that Simsic and Cheung fail to teach or suggest varying a filter strength as a function of the detected motion activity as is presently claimed.

Claims 1, 13, 14, 29, 33, 37, 41, and 45

Independent Claim 1, as amended recites "a filter module coupled with the video decoder and the output, said filter configured to filter the compression artifacts in the decoded video sequence, the filter module that is configured to filter the compression artifacts having a variable filter strength that is a function of motion activity within the video sequence." Independent Claims 13, 14, 29, 33, 37, 41, and 45 include similar types of recitations. To establish prima

facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *See* M.P.E.P § 2143.03. Applicant respectfully submits that Simsic and Cheung do not expressly teach or suggest at least the above recitations, and therefore the present claims are patentable over Simsic.

Simsic is directed to an apparatus for filtering interlaced signals for presentation on a non-interlaced display device. Interlaced display devices, such as television display devices typically display images using even and odd line interlacing. *See* Simsic, col. 1, lines 18-20. The interlaced video consists of one field of even line data and one field of odd line data, each field being displayed 30 times per second resulting in a complete frame being displayed 30 times a second. *See* col. 1, lines 21-24. When an interlaced signal is sent for display on a non-interlaced device, the non-interlaced device needs to "deinterlace" the signal so as to be able display a complete frame 60 times per second. *See* col. 1, line 24-26. During the deinterlacing process, certain edges in the non-interlaced signal need to be filtered. *See* col. 2, lines 45 and 46.

Thus, in contrast to filtering to remove compression artifacts, the focus of the filtering performed in Simsic is to blend adjacent odd and even lines. Simsic does not teach or suggest the need or how to remove artifacts that are due to compression of the video sequence. Compression artifacts can result from the coarse quantization of a prediction error signal. Filtering to remove artifacts caused by deinterlacing does not remove artifacts that originate as a result of video compression.

Furthermore, Simsic fails to teach or suggest providing a filter strength that is a function of motion activity within the video sequence. In the Office Action, the Examiner acknowledged this fact and took the position that this was disclosed by Cheung. The Examiner stated:

> Cheung et al disclose a video post filtering with motion compensated temporal filtering and/or spatial adaptive filtering comprising; a filter module having a variable filter strength that is a function of detected motion activity within the video sequence (column 3, lines 40-61). (See Office Action, p. 3.)

In the Advisory Action mailed June 21, 2004, the Examiner further stated:

> ... as to the strength of fiter that is function of detected motion, this limitation disclosed in Cheung, wherein adaptive filtering uses dynamic ranges of pixel values in blocks and selects a filter (Column 3, lines 40-60). (See Advisory Action p.2.)

Applicant again submits that although Cheung discloses adaptive filters, they do not teach or suggest a filter module having a variable filter strength that is a function of motion activity within the video sequence. For example, column 3, lines 40-61 of Cheung state the following:

> In accordance with an aspect of the invention, a video postfilter employs motion compensated temporal filtering and spatial adaptive filtering to improve image quality and remove coding artifacts. The temporal filtering uses motion vectors from multiple blocks to determine a reference value that is combined with the target pixel value being filtered. The reference value selected using multiple motion vectors better matches the target pixel value because the combination of motion vectors can better approximate motion of individual pixels than can a motion vector that indicates average motion of an entire block of pixel values. The spatial adaptive filtering uses the dynamic ranges of pixel values in blocks of different sizes to determine the visual context of the target pixel, and selects a filter for the target pixel according to the determined visual context. Such postfiltering processes improve video image quality and are applicable to any video image. However, the postfiltering processes are particularly suited for postfiltering a video image decoded in accordance with a video standard such as the well-known MPEG-1, MPEG-2, H.261, or H.263 video standard. (emphasis added)

In the quoted section, Cheung indicates that it uses the pixel values, to determine the "visual context." Applicant respectfully submits that when Cheung is determining the "visual context" it is *not* detecting motion within the frame but merely looking for hard-line edges within the frame. *See* col. 9, line 62- col. 10, line 3. If the difference in pixel values exceeds a certain threshold, it is assumed that there may be a hard-lined edge. As may be appreciated, it would be disadvantageous if hard-line edges became blurred as a result of filtering. Accordingly, the selection of a filter is based upon these determinations, to avoid such blurring. There is no teaching nor suggestion of varying filter strength as a function of motion activity within the video sequence, as is defined by the Applicant's claims.

Furthermore, Applicant respectfully submits that Cheung does not teach or suggest in other locations modifying a filter strength based upon motion actively in the video sequence. For example, in the temporal filter, Cheung describes a filtering technique that uses motion vector information of the provided frames to determine *which* reference pixels should be used in a filter with respect to a target pixel. However, Cheung does *not* analyze motion within the frame to determine the *strength* of the filter once a reference pixel has been identified.

For example, Equation 3 of Cheung, shows the way Cheung filters a pixel value P_{ij} for a current frame and a reference value R_{ij} to generate an output pixel value O_{ij}. Equation 3 states $O_{ij} = P_{ij} - F(P_{ij}-R_{ij})$. *See* col. 7, line 22. Filter Function $F(P_{ij}-R_{ij})$ is a function of a difference Δ between decoded pixel value P_{ij} and the associated reference value R_{ij}. The filter function may depend on coding parameters such as the macroblock quantization step size. *See* col. 7, lines 28-30. Table 2 of Cheung illustrates an exemplary filter function. *See* col. 7, lines 31 and 32. Thus, in Cheung, the filter strength is based upon the difference in energy between the target pixel and the reference pixel and the macroblock quantization step size. Applicant respectfully submits that this is not based upon the motion activity in the video sequence. Thus, Applicant respectfully submits that Cheung neither teaches nor suggests a filter module having a variable filter strength that is a function of motion activity within the video sequence.

Since Simsic and Cheung do not teach or suggest varying a filter strength as a function of motion activity within a video sequence, Applicant respectfully submits that independent Claims 1, 13, 14, 29, 33, 37, 41, and 45 are in condition for allowance.

Claims 2-4 and 24-28, 30-32, 34-36, 38-40, 42-44, 46 and 47

Since Claims 2-4, 24-28, 30-32, 34-36, 38-40, 42-44, 46 and 47 each depend on one of Claims 1, 13, 14, 29, 33, 37, 41, and 45 Applicant respectfully submits that these claims are allowable for at least the reasons discussed above and the subject matter of their own recitations.

Summary

Applicant has endeavored to address all of the Examiner's concerns as expressed in the outstanding Office Action. In light of the above remarks, reconsideration and withdrawal of the outstanding rejections is specifically requested. If the Examiner has any questions that may be answered by telephone, he is invited to call the undersigned directly.

Respectfully submitted,

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